

CLAIMS

What is claimed is:

1. An apparatus comprising:
a plurality of motors coupled to a shaft,
a plurality of motor control devices coupled to the plurality of motors, and
a plurality of bearings coupled to the motors and the shaft,
wherein the plurality of motors, the plurality of motor control devices and the
plurality of bearings continue to control the shaft rotation speed upon failure of
one of the plurality of motors, the plurality of motor control devices, and the
plurality of bearings.
2. The apparatus of claim 1, further comprising:
a bearing failure detection device coupled to the shaft.
3. The apparatus of claim 1, further comprising:
a fan blade coupled to a hub and the shaft,
a housing coupled to the plurality of motors, and
a heat sink coupled to the housing.
4. The apparatus of claim 1, wherein the plurality of motors each rotate in
one of a same direction and an opposite direction.

5. The apparatus of claim 1, wherein the plurality of bearings each having a plurality of rotating sleeves.
6. The apparatus of claim 5, wherein the plurality of rotating sleeves includes one of a bushing and a bearing set, a bushing and a plurality of bearing sets, and a plurality of bearing sets.
7. The apparatus of claim 6, wherein at least two of the plurality of sleeves are coupled with a frangible link.
8. The apparatus of claim 1, wherein the bearing failure detection device includes an optical emitter/receiver device, the optical emitter/receiver device transmits signals to a circuit, the transmitted signals include rotation information.
9. The apparatus of claim 8, wherein the rotation information includes information of rotational speed from one of the shaft, the plurality of bearings, and the shaft and the plurality of bearings.
10. The apparatus of claim 1, wherein the bearing failure detection device includes at least one strain gauge device, the strain gauge device transmits signals to a circuit, the transmitted signals include information on a failing bearing of the plurality of bearings.

11. The apparatus of claim 1, wherein the plurality of motors each having at least one pair of bifilar windings.

12. The apparatus of claim 11, wherein each of a plurality of single electrical pads are coupled to the at least one pair of bifilar windings and the plurality of motor control devices are each coupled to one of the plurality of single electrical pads.

13. The apparatus of claim 11, wherein each of a plurality of pairs of electrical pads are coupled to the at least one pair of bifilar windings, and at least two motor control devices of the plurality of motor control devices are coupled in parallel a single pair of the plurality of pairs of electrical pads.

14. An apparatus comprising:
at least one motor coupled to a shaft,
at least one bearing coupled to the at least one motor and the shaft, the at least one bearing having a plurality of rotating sleeves.

15. The apparatus of claim 14, wherein the plurality of rotating sleeves each have a bearing set.

16. The apparatus of claim 15, wherein the bearing set includes one of a plurality of ball bearings and a plurality of roller bearings.

17. The apparatus of claim 15, wherein the plurality of rotating sleeves includes one of a bushing and a bearing set, a bushing and a plurality of bearing sets, and a plurality of bearing sets.

18. The apparatus of claim 17, wherein at least two of the plurality of sleeves are coupled with a frangible link.

19. An apparatus comprising:
at least one motor coupled to a shaft, the at least one motor having at least eight magnetic lobes.

20. The apparatus of claim 19, further comprising:
at least one electrical pad coupled to the at least eight magnetic lobes, and
at least one motor control device coupled to the at least one electrical pad.

21. The apparatus of claim 19, further comprising:
at least two electrical pads coupled to the at least eight magnetic lobes,
and
at least two motor control devices coupled in parallel to each of the at least two electrical pads.

22. The apparatus of claim 21, wherein the at least two motor control devices operate simultaneously.
23. The apparatus of claim 21, wherein the at least two motor control devices operate independently.
24. An fan system comprising:
a plurality of motors coupled to a shaft,
a plurality of motor control devices coupled to the plurality of motors, and
a plurality of bearings coupled to the motors and the shaft,
a bearing failure detection device coupled to the shaft,
a fan blade coupled to a hub and the shaft,
a housing coupled to the plurality of motors, and
a heat sink coupled to the housing,
wherein the plurality of motors, the plurality of motor control devices and the plurality of bearings continue to rotate the fan blade upon failure of one of the plurality of motors, the plurality of motor control devices, and the plurality of bearings.
25. The fan system of claim 24, wherein the plurality of motors each rotate in one of a same direction and an opposite direction.
26. The fan system of claim 24, wherein the plurality of bearings each having a plurality of rotating sleeves.

27. The fan system of claim 26, wherein the plurality of rotating sleeves includes one of a bushing and a bearing set, a bushing and a plurality of bearing sets, and a plurality of bearing sets.

28. The fan system of claim 24, wherein the bearing failure detection device includes an optical emitter/receiver device, the optical emitter/receiver device transmits signals to a circuit, the transmitted signals include rotation information.

29. The fan system of claim 24, wherein the plurality of motors each having at least one pair of bifilar windings.